

## Soil Health and Microbes

### Soil health and microbes - Lesson plan

#### **Sequence**

All handouts describe different tests that will help students collect data on soils. Use your own discretion to determine which tests are appropriate to include for your grade level or course content. By the end of testing, students should be able to answer this prompt: "This soil is healthy and the best to grow x because..."

#### **Time**

Depending on how many soils students test, this could take up to 5-7 class periods.

#### **Materials**

Soil health comparison handout (or spreadsheet created for use by the class so students may share data)

Soil sampling handout

Soil texture handout

Soil food web handout

Soil nutrient test handout

dissecting scope or magnifying glass (magnifier app on phone)

Stop here if no access to microscopes

Soil biology handout

microscope slides

microscopes

Stop here if no access to Gram stain or agar for petri plates

Soil dilution handout

Gram stain-soil handout

Agar prep handout

Gram stain kit

Bunsen burner

water

petri dishes

powdered agar

incubator (optional)

#### **Objective**

Students use various tests to determine which soils are best for growing specific plants.

Scenario:

A grower would like to find the healthiest soil to grow a specific plant. (For example, tomatoes and soybeans need different soil conditions to grow best.) Choose a specific plant to grow, then complete the activities in this unit to determine the best soil for growing the chosen plant(s).

#### **Engage**

Introduce the scenario to students. Teachers may decide on plants that grow in one region of the country or allow for freedom of choice. They will need to decide on what plant they would like to grow and use the conditions that help that plant to recommend the best soil.

Have students brainstorm their method(s) for determining what makes a healthy soil, create a plan of action and allow them to pursue their plan.

For students that may need additional structure, start with collecting soil samples using the soil sampling handout. Once soils are collected look for life in the soil, (it is best to test while there is moisture in the soil). Soils may be stored in buckets with wet paper towels or cloth towels draped over the top. Once soils dry and are ground, texture is more easily determined.

#### **Explore**



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Students complete their tests and record their results on the soil comparison handout or a spreadsheet prepared for classroom use. Students will need to do some research about their chosen plant, the characteristics of healthy soil and the climate zones best suited for that plant.

### Explain

Students analyze data to determine which soil(s) have the healthiest profile to create a presentation for the grower they have been working for. The format should follow the Claim, Evidence and Reasoning protocol (CER) to answer this prompt: “This soil is healthy and the best to grow x because...” (See <https://www.youtube.com/watch?v=JGOxVIgmGWE> for a video to show students who may struggle with this.)

### Evaluate

Once CERs have been presented, students use a rubric to assess their ability to use the protocols for the testing they completed as well as their decision on what makes a healthy soil. Having multiple groups test some of the same soils will help students see that soils may be well-suited for one plant, but not another.

### Extend

Students may do additional research to determine how growers may improve the characteristics of particular soils in order to grow better plants.

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